



Dr. Ellen Kaye Gehrke and her horse Shiloh sharing heart rhythm connection during pilot study I.

The Horse-Human Heart Connection

Results of Studies Using Heart Rate Variability

By Ellen Kaye Gehrke, PhD

In the EAAT field we have all witnessed the healing power of horses on humans and often experienced it ourselves. But what if it could be scientifically proven? We could then back up the anecdotal cases documenting the beneficial effect horses have on humans with quantitative research and further validate EAAT, particularly the discipline of equine facilitated mental health.

The Institute of HeartMath® in Boulder Creek, CA, has been doing some very interesting research in this regard, showing how people and animals affect each other. According to

IHM research director Dr. Rollin McCraty, "It appears that there is a type of communication occurring between people above and beyond body language or verbal communication. I believe we'll see in future research studies that we are affecting each other's moods and attitudes, both positively and negatively by the electromagnetic fields we radiate. In our work with pets and their owners, we're seeing that a pet owner can create what we call a heart-filled environment when practicing heart-focused techniques. The pets respond by becoming more affectionate, more

animated and more connected with the pet owner."

In one example, researchers showed how, when an owner petted and emotionally bonded with his dog, the beat-to-beat fluctuations in the hearts of the owner and his pet started to synchronize and then matched one another. These heart rhythm patterns, the intervals between consecutive heart beats, are independent of heart rate and known as heart rate variability (HRV). A non-invasive measure, HRV reflects heart-brain interactions and is particularly sensitive to changes in emotional states.

Positive and negative emotions can readily be distinguished by changes in these heart rhythm patterns. When a negative emotion such as sadness, fear, anger or frustration is experienced, heart rhythms become more erratic and imbalanced (incoherent). Positive emotions such as joy, appreciation and love produce ordered, balanced (coherent), heart rhythm patterns.

By recording and analyzing HRV recordings, it is possible to determine whether a human or an animal is emotionally stressed or relaxed. Even if people try to conceal their emotions, the HRV will show whether a person is anxious or calm, because it reflects autonomic nervous system responses that are not under conscious control. (The autonomic nervous system is a regulatory branch of the central nervous system that helps people adapt to changes in their environment. It adjusts or modifies some functions in response to stress.)

First Pilot Study

As researchers, we wondered if a scientific study, similar to the one conducted at HeartMath, would support using HRV as a marker to demonstrate the emotional connection occurring between horses and humans when they interact. To determine this, we conducted five pilot studies beginning in 2005. The results could eventually make a difference in how those in the EAAT field:

- Match horses with human partners and groups.
- Select the most appropriate types of interventions between the horse and human.
- Monitor the internal psychophysiology of both horses and humans separately and together.

In the first study conducted in Ramona, CA, at Dr. Ellen Kaye Gehrke's ranch, four of her horses

were fitted with ECG holter (heart rate) monitors. The monitors were synchronized and a protocol, or plan, designed in collaboration with HeartMath, was followed for data collection. The 40-minute protocol was carefully monitored and repeated with the same human subject and four different horses. The following sequence was included:

1. A baseline of data with the horse and human separate from each other.
2. The horse and human together in an arena with the human sending heart-centered emotions of appreciation and care in the direction of the horse.
3. A grooming session.
4. Companion walking.
5. A riding sequence.

When the data were analyzed by HeartMath, it was apparent that there were regular rhythms occurring in the HRVs of many of the horses. However, we did not fully understand the physiological significance of these rhythms. Regular rhythms appeared in the humans' HRVs when they were sending emotions of appreciation and care towards the horse. In one case, the horse only showed regular HRV rhythms when the person was projecting feelings of appreciation. Based on the pilot study, it was concluded that the research was worth pursuing since we found there were indications of a relationship in HRV between horses and humans.

Second Pilot Study

Realizing that it was important to establish that HRV in horses exhibited similar patterns as humans, the second study included 12 horses from the same herd. (The research was funded by Lisa Walters and Richard Lang of The EquuSatori Center.) In the study, every horse was monitored

for 24 hours to determine each horse's baseline HRV. The results confirmed that horse HRV rhythms, although somewhat slower than human HRV rhythms, oscillate, (fluctuate) within a similar frequency range (0.01 to 0.4 Hz), indicating that the same instrument set at the same setting can be used to accurately measure HRV in both humans and horses. On the basis of these results, we assumed that an HRV analysis could be used as a marker to demonstrate a connection between horses and humans.

The 24-hour readings provided another note of interest. During the 24-hour recording all the horses demonstrated very consistent HRV patterns, indicative of experiencing positive emotional states, unless something fearful or threatening was introduced. Even then, once the "scary" intruder left (e.g., the trash truck), HRV returned to a coherent pattern within a few minutes. Horses in this herd appeared to live in a healthy state with a balanced autonomic nervous system. Based on HRV research on stress in horses this meant the horses were primarily in a positive emotional state throughout the 24-hour readings. This did not include any riding or human interaction other than normal feeding patterns.

Third Pilot Study

The third pilot study was designed to explore the question of whether horses, when interacting with each other, exhibited signs of emotion that could indicate their sentient nature. Dr. Ellen Kaye Gehrke attached external ECG monitors to four different pairs of horses to capture the activity of the heart over time. Two of the pairs included horses known to be close friends. One pair included horses in the same herd who rarely interacted. The fourth pair included a mare and her 4-month old filly.

The 30-minute protocol for each pair was as follows:

- Horses together.
- A horse taken out of sight of the other horse by the horse handler.
- Horses brought back together.
- The second horse taken out of sight by the horse handler.

The results confirmed that horses are in tune with one another as indicated by changes in the HRV patterns. The close friend pairs had HRV patterns showing some degree of synchronicity, rising and falling together for the most part. The HRVs of the non-friends showed no relationship with one another, and the mare and foal were unable to be separated out of sight since the stress reaction was so strong.

One pair of horses had, what would be labeled in human terms, a co-dependent relationship. Even though their HRVs overlapped when together, their HRV measures indicated significant stress when they were separated from one another. This part of the study appears to confirm that horses are sentient beings aware of, and connected to, their herd mates, and that they have emotional reactions when changes occur in their situation.

The researchers commented on their own experiences of observing the reactions of horses who live together when one is taken away for a ride or a therapy session, and the other horse acts extremely stressed and unfocused on "the job." Based on this part of the study, it appeared to confirm that horses are sentient beings, that is, they are aware of, and connected to, their herd mates and that they have emotional reactions when changes occur in their situation.

Fourth & Fifth Studies

The fourth and fifth pilot studies included horses interacting with their

owners similar to the initial protocol and introduced an unknown person. One might have thought that if a horse did not know the human in the study, the horse's HRV would reveal more stress. This was not the case. As it turned out, it really did not make a difference whether the horse knew the person or not. The rhythm of the person's HRV was more important than whether they had a relationship with the horse. That meant that when a horse interacted with an unknown human, the horse's stress level was entirely dependent on the stress level of the human. If someone had an unstressed, balanced HRV, then the horses were interested in interacting with them, which was reflected in the horses' HRV readings, indicating they were relaxed.

At this stage we wanted to explore the intensity of the relationship between horses and humans. Dr. Ann Baldwin, a physiologist from the University of Arizona, joined Dr. Kaye Gehrke for the fifth study. Data were collected in Tucson in September 2008 with seven pairs of horses and humans. The data looked very much like those of the original pilot study, except that Dr. Baldwin was able to go beyond HeartMath's data analysis and actually pick out the specific rhythmic frequencies of HRV for each horse and each human.

We found that when humans projected a positive emotional state to the horse, a frequency spike appeared in the person's HRV of about 0.1 cycles/second. This means that when people experience positive emotions their heart rate cycles up and down regularly every 10 seconds. This gives us a way of measuring whether a person is effectively projecting positive emotions or not. Interestingly, the HRV frequencies specific to that horse showed up in all but one of the human subjects' HRV. It appeared that each person synchronized his or her particular HRV frequency cycle to



Storm and Rusty showed almost identical HRV patterns, raising the question of whether horses, when interacting with humans, could indicate their sentient nature.

match the horse's specific frequency cycle. This result was reproducible and was observed in six out of the seven horse-human pairs. The synchronicity was sometimes seen if the person was just sitting calmly in the arena with the horse and not consciously projecting positive feelings towards the horse.

In the one horse-human pair in which the human did not match the horse's specific frequencies, the person stated that she was distracted with other responsibilities during the recording. Her HRV also did not display the characteristic frequency spike associated with feeling positive emotions.

Findings

The following are potential findings at this stage of the research; however, more research is needed to confirm preliminary results.

1. There is a relationship between



hms during pilot study 3, which explored the each other, exhibited signs of emotion that

horses and humans that can be measured using heart rate variability to potentially determine levels of stress or well-being in the human and the horse when interacting.

2. Horses' HRVs are observed to be similar in frequency dynamics to humans and can be used as an indicator for research studies between horses and humans of well-being and stress reactions.
3. Horses are sentient beings as demonstrated by their stress reactions when interacting and experiencing separation from herd members.
4. The well-being of both the human and the horse, as measured by HRV, are more important indicators of relationship than whether or not the horse is familiar with person.
5. It appears that HRV frequency cycles from the horse influence the human's cycle but not vice-versa.

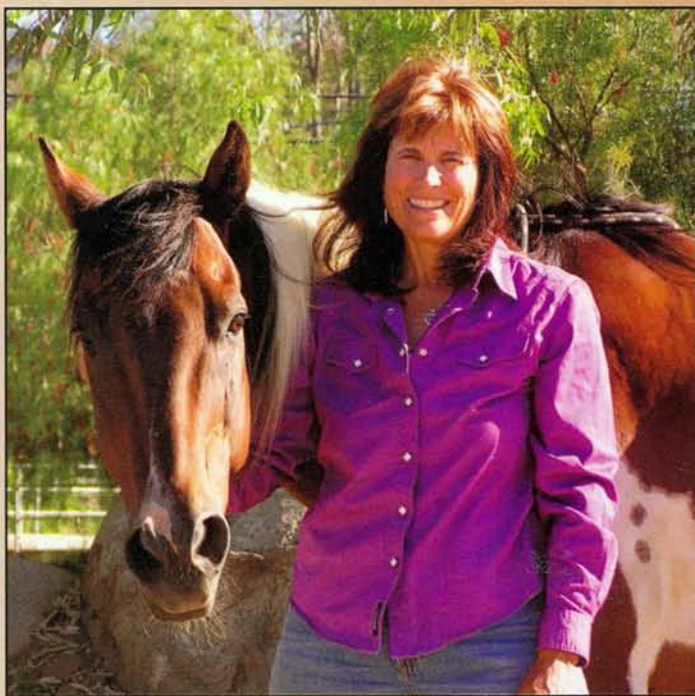
This is shown by the fact that the horse HRV frequency spikes showed up in the human cycles and not the other way around.

6. Research does not confirm that horses "mirror" the emotional state of the human. However, there is a dynamic that occurs.
7. Initial findings seem to reveal that the calmness or autonomic state of the horses has a greater influence on the human response rather than the other way around. This could be why it is so important to select the appropriate horses for EAAT interventions because not every horse may be suitable.

Findings also indicate that it may also be the responsibility of the human to promote bonding. If a person can project feelings of care and appreciation toward a horse, the horse may detect those feelings and, in turn, may share them with the human. For example, when a horse is experiencing positive emotions from a person, they will very often approach and stay close to that person, which may instill a mutual trust between the two. In cases where the horse is relaxed and the human is exhibiting stress, it is possible that the horse's calming feeling may be transferred to the human to help the person relax. To assess this, we can measure the effect of the horse on the human's emotions by comparing the person's HRV before and after their interaction with the horse.

Although more intensive data collection is necessary, these preliminary results demonstrate the potential of using HRV to measure the connection of the heart between horses and humans. Potentially this research could scientifically demonstrate the physiological and psychological benefits of horse/human interactions for both parties.

Ellen Kaye Gehrke, PhD, is a professor of community health, a director for the Master's program in integrative health-care at National University in San Diego, CA, and a member of NARHA and EFMHA. She conducts programs for individuals and organizations with her 10 horses at her Rolling Horse Ranch in Ramona, CA. There she leads a Skills for Relationship Centered Care class for the USCD Medical School students. She also works with San Diego Hospice's Grief Camp and is conducting a research project with families on how horses help the adaptation process of grief and loss. She has another research project underway with the Training, Education, Research Institute (TERI) Therapeutic Riding Center in Vista, CA, using HRV as a measure of stress reduction and autonomic balancing in children with autism who receive therapeutic riding services.



Dr. Ellen Kaye Gehrke and Cougar, one of her 10 horses at her Rolling Horse Ranch in Ramona, CA.